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## Probability Rules Review- 2

1. If  $P(A) = 0.65$  and  $P(B) = 0.23$  and  $P(A \cap B) = 0.15$ , find the following:

a.  $P(A \cup B) = P(A) + P(B) - P(A \cap B) = 0.73$

b.  $P(B|A) \Rightarrow P(A \cap B) = P(A) \cdot P(B|A)$   
 $0.15 = 0.65 \cdot P(B|A)$

$P(B|A) = 0.231$

- c. Are A and B disjoint events? Why or why not?

No.  $P(A \cap B) \neq 0$

- d. Are A and B independent? Why or why not?

$P(A \cap B) = P(A) \cdot P(B)$   $0.15 = (0.65)(0.23)$   
 $0.15 \neq 0.1495$

No!

2. If  $P(D) = 0.37$ ,  $P(C) = 0.41$  and D and C are disjoint, what is the probability of D or C?

$P(D \cup C) = P(D) + P(C) - P(D \cap C)$   
 $= 0.37 + 0.41 - 0 = 0.78$

3. If  $P(K) = 0.71$ ,  $P(R) = 0.23$  and K and R are independent, what is the probability of K and R?

$P(K \cap R) = P(K) \cdot P(R)$   
 $= (0.71)(0.23) = 0.1633$

4. If  $P(F) = 0.33$  and  $P(H) = 0.28$  and  $P(H|F) = 0.13$ , find the following:

a.  $P(F \text{ and } H) = P(F \cap H) = P(F) \cdot P(H|F) = (0.33)(0.13) = 0.0429$

b.  $P(F \text{ or } H) = P(F \cup H) = P(F) + P(H) - P(F \cap H) = 0.48$

5. A fair coin is tossed and a card is picked from a standard 52-card deck. The probability of getting a head and picking a diamond is:

(A)  $\frac{1}{8}$

(B)  $\frac{2}{3}$

(C)  $\frac{1}{2}$

(D)  $\frac{1}{4}$

(E)  $\frac{1}{3}$

\* Independent

$P(H \cap \text{Diamond}) = P(H) \cdot P(D)$   
 $= \left(\frac{1}{2}\right)\left(\frac{1}{4}\right)$   
 $= \frac{1}{8}$

6. If event M has a probability of 0.78, what is the complement of event M?

- (A) 0.85  
(B) 0.35  
(C) 0.12  
(D) 0.22  
(E) None of these answers is correct

7. Let the sample space,  $S = \{\text{all whole number from 15 through 30}\}$

Let the event  $A = \{15, 18, 21, 24, 27, 30\}$

Let the event  $B = \{16, 22, 25, 27, 28, 30\}$

Let the event  $C = \{17, 18, 19, 20, 23, 25, 26\}$

Let the event  $D = \{15, 17, 19, 21, 23, 25, 27, 29\}$

Find the following:

a.  $A \cap B = \{27, 30\}$

b.  $P(A \cap B) = \frac{2}{16} = \frac{1}{8}$

c.  $C^c = \{15, 16, 21, 22, 24, 27, 28, 29, 30\}$

d.  $P(D \cap B) = \frac{2}{16}$

e.  $P(A \cup B) = \frac{10}{16}$

f.  $P(A \cap D) = \frac{3}{16}$

g.  $P(B^c) = \frac{10}{16}$

h.  $C \cup B = \{16, 17, 18, 19, 20, 22, 23, 25, 26, 27, 28, 30\}$

8. If  $P(A) = 0.25$ ,  $P(A \cup B) = 0.78$ , and  $P(A \cap B) = 0.12$ , find  $P(B)$ .

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$0.78 = 0.25 + P(B) - 0.12$$

$$0.78 = 0.13 + P(B)$$

$$P(B) = 0.65$$

For the next questions, put the probability statements into notation to help you.

9. On a certain day, there is a 37% chance for rain. The probability of John remembering to bring an umbrella to work **and** it raining is 15%. What is the probability that it rains **given that** John remembers to bring an umbrella?

$$P(R) = 0.37$$

$$P(J \cap R) = 0.15$$

$$P(R|J) = ?$$

$$P(J \cap R) = P(R) \cdot P(R|J)$$

$$0.15 = 0.37 \cdot P(R|J)$$

$$0.15 = 0.37 \cdot P(R|J)$$

$$P(R|J) = 0.4054$$

10. In a History class, 50% of the students are males. The probability of a student being a male and a junior is 20%. What is the probability that a student selected at random is a junior given that the student is a male?

$$P(M) = 0.50$$

$$P(M \cap J) = 0.20$$

$$P(J|M) = ?$$

$$P(M \cap J) = P(M) \cdot P(J|M)$$

$$0.20 = 0.50 \cdot P(J|M)$$

$$P(J|M) = 0.40$$

11. Out of a group of 35 students, how many ways can we choose a sample of 7 students?

$$35 n C r 7 = 6,724,520$$

12. There are 60 people that have entered a raffle drawing. There are 4 prizes being given out (\$100, \$75, \$50, \$25). How many different ways can this be done?

$$60 n P r 4 = 11,703,240$$

13. We want to create a school committee by choosing 4 seniors from a group of 40 seniors, 4 juniors from a group of 65 juniors, and 4 sophomores from a group of 50 sophomores. How many ways can this be done?

$$(40 n C r 4)(65 n C r 4)(50 n C r 4) = 1.425 \times 10^{16}$$